

Trip Report: Summary of the Meetings of the ASTM E06.22 Subcommittee, E06.22.05 and E06.22.07 Task Groups, and the ISO TC 160, SC1, WG 4.

April 15 and 16, 2002, Pittsburgh, Pa

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On April 15 and 16, the author attended selected meetings of ASTM Committee E06, Performance of Buildings, i.e., Subcommittee (SC) E06.22 for Durability Performance and Task Groups (TGs) E06.22.05 for Sealed Insulation Glass and E06.22.07 for Durability of Chromogenic Glazings (the TG chaired by the author). The TG E06.22.02 on Fenestration Durability did not meet. The author also attended a meeting of ISO TC 160, SC1, working group (WG) 4. Because the author was asked to serve as secretary for the E06.22 SC meeting, the essential actions by TG E06.22.05 for Sealed Insulation Glass are contained in the minutes of the E06.22 SC. Other discussions during the E06.22.05 TG meeting are summarized in this report.

E06.22, Durability Performance SC, (J. Haberer, JHaberer@cardinalcorp.com, Acting Chairman). The minutes of this meeting are attached as Appendix 1 and contain all the essential actions by the SC.

E06.22.07—Durability of Chromogenic Glazing TG, (A. Czanderna, czanalv@attglobal.net, Chairman). The minutes of this meeting are attached as Appendix 2 and contain all the essential actions by the TG; the agenda for the meeting is attached to the minutes.

E06.22.05—Sealed Insulating Glass (J. Haberer, Chairman). The TG met from 1005 h to 1200 h on 4/15/02. About 15 people attended the TG meeting. The minutes of the previous meetings in October (Dallas, TX) were approved as distributed after some minor amendments.

The Chairman reported that the negatives were withdrawn for the three harmonized insulating glass standards (HIGS) and that the documents are in the process of being published by ASTM. The ASTM numbers, prior placeholder numbers, and titles are: ASTM E 2188, E-XXX, Standard Test Method for Insulating Glass Unit Performance; ASTM E 2189, E-YYY, Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units; and ASTM E 2190, E-ZZZ, Standard Specification for Insulating Glass Unit Performance and Evaluation. These new standards will be available from ASTM by about the end of May 2002. They represent about seven years of effort with Canada to develop a common North American standard. These new standards are comparable to ASTM E 773, E 774, and E 1887, which remain as ASTM standards, and CAN/CGSB 12.8.

The Chairman announced the new proposed test methods using a gas chromatograph or oxygen analyzer for measuring gas fills in IGUs had not been balloted because of a misunderstanding in communications with ASTM. By consensus, the TG resolved to request ASTM for concurrent E06.22 and E06 ballots (see the attached minutes of the E06.22 SC, items 5 and 6). Anne Spinks will update the two documents for editorial changes recommended by the TG. The status of round robin testing using the HIGS standards E 2188 (weathering) and E 2189 (fogging) was summarized. Only one of the testing laboratories has completed the first round of tests. Five manufacturers (Trulite, Truseal, H. B. Fuller, PRC, and Cardinal) are supplying fifteen IGUs for the round robin tests. Three randomly selected specimens from each supplier are being sent to five testing laboratories (NRC—Elmahdy, Bodycote—Major, PRC—Virnelson, and H. B. Fuller—Spinks, 2 sets) for evaluation. Anne Spinks (H. B. Fuller) is coordinating the testing activities.

The Chairman distributed an updated copy of the project list and the priorities for addressing the development of standards by the TG. In addition to obtaining approval of Items 5 and 6 (in the E06.22 SC minutes), the priorities include developing standards for (1) the non-destructive testing for argon concentration in deployed (i.e., in-service) insulating glass units, (2) using higher fog box temperatures, (3) measuring the gas loss from the cavity in an IGU before and after durability testing, (4) IGUs used in structural glazings, (5) testing Spandrel Glass and/or non-glass substrates, (6) a weathering test based on moisture penetration, (7) identifying a mechanical frost point method, (8) assessing spacer adhesion, and (9) an accelerated weathering test for advanced fenestration units that operate at about 90°C and at high humidities. No interim meeting will be scheduled, so the next meeting will be on Oct. 14 in Norfolk, VA. The meeting was adjourned at 1200 h.

ISO TC 160, SC1, WG 4. The Chair, A. William Lingnell, called the meeting to order at 0810 h on April 16. Members present included Jeff Haberer (Executive Secretary), USA; Claude De Niet, France/Belgium (replacing Francis Serruys); Michel Dubru, The Netherlands/Belgium (for Jacob Zwart); Hakim Elmahdy, Canada; Bernard Lowe, UK; and Hidemi Nakai, Japan. Observers present were Al Czanderna and Anne Spinks of the USA, Harada Takeshi of Japan, and Allan Major and Ray Wakefield, Canada. Members absent included the representatives from Australia, Austria, Italy, Korea, and Brian Hollis of the UK. The official list of delegates was circulated for attendance. The group has ten active members. The minutes of the 10/21/01 meeting in Dallas, TX, USA were approved as distributed.

The Chair summarized recent events with TC160. Haberer reported on the status of the HIGS documents E-XXX, E-YYY, and E-ZZZ (see details in the summary of the E06.22.05 TG meeting). De Niet reported on the status of the six-part CEN standard (Glass in Buildings—Insulating Glass Units). The CEN standards have changed templates, so even when all the present draft standards are approved, they will have to be rewritten according to the new template and submitted for a new vote. The scope of each of the six CEN standards addresses the issues of energy savings, health, and safety. Parts 4 and 6 have been accepted, parts 1, 2, and 3 are in the process of being balloted, and Part 5 is being reviewed prior to being submitted for a vote. Parts 1—4 are relevant for WG 4 and are entitled Part 1: Generalities, dimensional tolerances and rules for system descriptions; Part 2: Long-term test method and requirements for moisture penetration; Part 3: Long-term test method and requirements for gas concentration tolerances; and Part 4: Methods of test for the physical attributes of edge seals. Parts 5 and 6 deal with evaluation of conformity and factory production control, respectively.

The draft of a New Work Item Proposal was reviewed and updated. The focus of the proposal is to produce one integrated standard with multiple approaches rather than a series of related standards. The scope for the proposal is given as “This International Standard specifies approaches for evaluating insulating glass units. The approaches described include test methods and specifications for establishing the minimum requirements for (a) durability of edge seals by climate tests, (b) chemical fogging tests, (c) gas concentration/retention, and (d) edge seal attributes and test methods for ensuring continuing compliance to the standard.” The Chair requested reports by volunteers from the members present for writing each of the major sections as follows: Scope-Lingnell, Terminology-Dubru/Zwart, (a) Haberer/Nakai, (b) Elmahdy, (c) De Niet, and (d) Lowe. Only De Niet and Lingnell completed most of their assignments, which were

to be done by this meeting. The delegates present committed themselves to a timetable for completing the attachments to the proposal by July 15, reviewing the draft by September 1, and being prepared to adopt the final version for IEA at the next meeting (tentatively scheduled for October 13 in Norfolk, VA). The draft attachments for the work proposal will be available after July 15 from Haberer with a contact of JHaberer@cardinalcorp.com. The delegates resolved to authorize Lingnell to submit the proposal on April 17, 2002 for review and comment by the IEA.

(The "Warm-climate IG Method," which was summarized and discussed at the April 1, 2001 meeting, will be kept on the Agenda for future meetings. The intent of the Warm-Climate IG Method is to replace 60°C used in most testing protocols with 90°C for the next generation of advanced windows.) The meeting was adjourned at 1120 h.

Appendix 1 **ASTM E06.22, Durability Performance Subcommittee** **Minutes, April 15, 2002, Pittsburgh, PA**

Subcommittee (SC) members present were: Jeff Haberer (Acting Chair), Al Czanderna (Acting Secretary), Hakim Elmahdy, Gerald Hendrickson, Allan Major, Anne Spinks, and Theresa Weston. The visitor present was Scot Miller (non-voting).

Haberer called the meeting to order at 1610 h. An attendance sheet was circulated. The Chair announced the agenda for the SC meeting. Approval of the minutes of the October meeting in Dallas was deferred until the Acting Chair makes the minutes available. The meeting consisted of receiving reports and action items by the three Task Group (TG) Chairmen present: J. Haberer (E06.22.05), A. Czanderna (E06.22.07) and T. Weston (E06.22.09). The TG Fenestration Durability (E06.22.02) did not meet because the Chairman did not attend the meeting or arrange for a substitute. T. Weston reported that the Air and Weather Barriers TG, which has now met for the fourth time, is still establishing a suitable title for the TG, organizing, defining its scope, and identifying needed standards. From the other two task groups, Items 1 and 2 (see below) have been balloted with the E06.22 SC for the Durability of Chromogenic Glazings TG (07). Items 3 and 4 need to be balloted for the Durability of Chromogenic Glazings TG (07) and Items 5 and 6 need to be balloted for the Sealed Insulating Glass TG (05), respectively.

Item 1 (E 2XXX-02). Draft Standard Test Method for Assessing the Current-Voltage Cycling Stability at 90°C of Absorptive Electrochromic Coating on Sealed Insulating Glass Units. The E06.22 vote was 8-0-47 with one official and two unofficial sets of comments. **Action: forward to E06 for a ballot (automatic—no negatives).** The Task Group made editorial revisions in the balloted document to accommodate comments received about the document reviewed by the E06.22 SC. Czanderna will provide ASTM with a copy of the document in which the editorial revisions approved by the E06.22.07 Task Group have been incorporated.

Item 2 (E 2YYY-02). Draft Standard Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coating on Sealed Insulating Glass. The E06.22 vote was 8-0-47 with one official and two unofficial sets of comments. **Action: forward to E06 for a ballot (automatic—no negatives).** The Task Group made editorial revisions in the balloted document to accommodate comments received about the document

reviewed by the E06.22 SC. Czanderna will provide ASTM with a copy of the document in which the editorial revisions approved by the E06.22.07 Task Group have been incorporated.

Item 3 (E 2141-01). The Task Group agreed to making the editorial revisions suggested and to adding four notes in the existing standard to accommodate comments received about the document from a primary user of the standard. **Czanderna (Second, Weston) moved that the revisions be submitted to the E06.22 SC and the E06 Committee for a concurrent ballot of the recommended revisions and additions. Carried (7-0-0).** Czanderna will provide ASTM with a copy of the document in which the proposed revisions approved by the E06.22.07 Task Group have been incorporated.

Item 4 (E 2ZZZ-02). Proposed Draft Standard Entitled “Standard Test Method for Assessing the Stability in High Humidity or Cyclic Temperature Environments of Absorptive Electrochromic Coatings on Insulating Glass Units.” **Czanderna (Second, Weston) moved that the proposed draft be submitted to the E06.22 Subcommittee for a ballot subject to circulating (via email) the revised version adopted by the task group to the task group members present on April 15 for their review and comment prior to submission to ASTM for the ballot. Carried (6-0-1).** Czanderna will provide ASTM with a copy of the document in which the revisions approved by the E06.22.07 Task Group have been incorporated.

Item 5 (E AAA). Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units Using Gas Chromatography. **Spinks (Second, Czanderna) moved that the document be submitted to the E06.22 Subcommittee and the E06 Committee for a concurrent ballot of the recommended proposed standard. Carried (7-0-0).** Anne Spinks will provide ASTM with a copy of the document in which the revisions requested in the E06.22.05 Task Group have been incorporated.

Item 6 (E-BBB). Standard Test Method for Determining the Concentration of Fill Gas in a Sealed Insulating Glass Unit Using an Oxygen Analyzer. **Spinks (Second, Major) moved that the document be submitted to the E06.22 Subcommittee and the E06 Committee for a concurrent ballot of the recommended proposed standard. Carried (6-0-1).** Anne Spinks will provide ASTM with a copy of the document in which the revisions requested in the E06.22.05 Task Group have been incorporated.

Summary for the Next E06 Committee and E06.22 Subcommittee Ballots. The editorially revised versions of Items 1 and 2, proposed revisions to E 2141 in Item 3, and final versions of Items 5 and 6 need to be balloted with full participation by Committee 06. Items 3, 5, and 6 need to be balloted concurrently with participation by Subcommittee E06.22. Item 4 needs to be balloted with participation only by Subcommittee E06.22.

The meeting was adjourned at 1655 h.

The minutes were prepared by A. W. Czanderna on April 18, 2002, 0900 h, MDT.

Appendix 2.
Minutes: ASTM E06.22.07; Task Group, Durability of Chromogenic Glazings
April 15, 2002, Pittsburgh, PA

Task Group (TG) members present were A. Czanderna (Chairman), Hakim Elmahdy, Jeff Haberer, Gerald Hendrikson, Milind Jhaveri, Bill Lingnell, Allan Major, and Anne Spinks; Scot Miller attended as an observer in place of Bill Guthrie.

Czanderna called the meeting to order at 1302 h. The Agenda for the Task Group (TG) meeting is attached as Document 1. The minutes of the October 22, 2001 meeting at Dallas, TX were approved as distributed. Hakim Elmahdy commented on the status of IGU testing activities in the IEA-27 Task, which includes durability studies of electrochromic glazings. However, Elmahdy did not attend the project meetings related to electrochromic glazings. For discussion of the documents E 2XXX, E 2YYY, and E 2141, copies showing all proposed changes had been distributed via email prior to the meeting and marked printed copies were distributed to each attendee at the meeting.

Concerning the draft “Standard Test Method for Assessing the Current-Voltage Cycling Stability at 90°C of Absorptive Electrochromic Coating on Sealed Insulating Glass Units” (E 2XXX-02), the E06.22 vote was 8-0-47 with one official and two unofficial sets of comments. **Action: forward to E06 for a ballot (automatic—no negatives).** A copy of the proposed editorial revisions was distributed to each attendee and a master copy is on file with the Chairman. The Task Group reviewed each editorial revision to the balloted document to accommodate the comments received about the document balloted by the E06.22 SC. Spinks moved the revisions be adopted. Carried (4-0-1).

Concerning the draft “Standard Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coating on Sealed Insulating Glass Units (E 2YYY-02), the E06.22 vote was 8-0-47 with one official and two unofficial sets of comments. **Action: forward to E06 for a ballot (automatic—no negatives).** A copy of the proposed editorial revisions was distributed to each attendee and a master copy is on file with the Chairman. The Task Group reviewed each proposed editorial revision in the balloted document to accommodate comments received about the document balloted by the E06.22 SC. Spinks moved the revisions be adopted. Carried (5-0-2).

The TG discussed several proposed minor revisions to ASTM E 2141-01 entitled “Standard Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units.” The minor revisions were suggested to the Chairman by Helen Sanders of SAGE Corporation, which has become the principal user of the document, to clarify the testing temperatures and to provide cautionary statements in the form of notes. The Task Group agreed that the two suggested editorial revisions and four notes should be added to the existing document. Haberer moved the revisions be adopted and forwarded to E06.22 with a request for concurrent ballots by E06.22 and E06. Carried (7-0-0). Czanderna will send to S. Mawn copies of E 2XXX-02, E 2YYY-02, and the selected sections of 2141-01 in which the editorial revisions approved by the E06.22.07 Task Group have been incorporated or are shown.

Most of the meeting was devoted to improving the first draft of a “Standard Test Method for Assessing the Stability in High Humidity or Cyclic Temperature Environments of Absorptive Electrochromic Coating on Sealed Insulating Glass Units” (E 2ZZZ-02). A number of revisions were identified in all sections of the distributed document. The major partially resolved issue was concerned with measuring the temperature during cycling, i.e., should the user measure only the chamber temperature, only the specimen temperature, or both. For measuring the specimen temperature, where should the temperature be measured? The Chairman was given the latitude to revise the document to provide a consistent procedure for measuring the chamber temperature and the specimen temperature near the IG seal. The reason for measuring the temperature close to the IGU seal is because the most likely failure, especially during the 90°C part of the cyclic temperature exposure, is the IGU seal. Lingnell moved that the E06.22 Subcommittee be asked to vote on the revised draft via a subcommittee ballot (Carried 6-2-0). Based on the discussion of the motion, the Chairman agreed to circulate (via email) the revised version adopted by the task group to the task group members present on April 15 for their review and comment prior to submission to ASTM for the ballot. The goal of the ballot is to secure feedback from the SC without generating too many negative comments. After the review and comment by members of the TG, Czanderna will send a copy of the revised version of E 2ZZZ-02 to S. Mawn at ASTM for the SC ballot.

The Chairman will request space for a 4-h meeting on Monday afternoon, October 14, 2002. The meeting was adjourned at 1604 h.

P. S. (Not part of the TG meeting). The priority for preparing additional ASTM standards by the TG was determined at the April 2000 meeting in Toronto. With the completion of E 2XXX, E 2YYY, and E 2ZZZ, the only two remaining standards of the five most urgent ones identified at Toronto will require absorptive electrochromic coatings on insulating glass units are to pass: (1) initial uniformity inspection and transmittance measurements in the colored, bleached, and transition states (the lateral transmittance in the colored, bleached and transition states must be \leq "x" %) in which the value of "x" and the permitted changes in the three lateral transmittances are to be determined (measured) and incorporated into a standard specification and (2) a sudden exposure to a spray of water at 25°C when the electrochromic coating temperature is at 90°C just prior to the sudden exposure (No cracking of coatings or seal failures). Helen Sanders of SAGE is planning to provide the essence of the test methods in (1) and (2) to the Chairman by the end of June, which will permit him to prepare draft standards about (1) and (2) for the October 14, 2002 meeting of the TG.

DOCUMENT 1**AGENDA**

April 15, 2002, Monday, from 1 p.m. to 4 p.m.

ASTM E06.22.07 Task Group: Durability of Chromogenic Glazings

Hotel: Hilton Pittsburgh and Towers

Phone: (412) 391-4600, FAX: (412) 594-5161

Gateway Center, Pittsburgh, PA 15222

1. Introductions (A. Czanderna will continue to serve as Chairman for the year 2002)
2. Review the Agenda (DOCUMENT 1), Approval of the Minutes (*Reproduced on the other side of this sheet, DOCUMENT 2*) from the October 22, 2001 meeting in Dallas, TX, and Comments about the IEA-27 Task Meeting in Copenhagen, Denmark.
3. Discuss Revisions to Draft Standard Test Method for Assessing the Current-Voltage Cycling Stability at 90°C of Absorptive Electrochromic Coating on Sealed Insulating Glass Units. (DOCUMENT 3). Forward for E06 Ballot (automatic—no negatives).
4. Discuss Revisions to Draft Standard Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coating on Sealed Insulating Glass Units (DOCUMENT 4). Forward for E06 Ballot (automatic—no negatives).
5. Discuss Proposed Draft Standard Entitled “Standard Test Method for Assessing the Stability in High Humidity or Cyclic Temperature Environments of Absorptive Electrochromic Coating on Sealed Insulating Glass Units.”
6. Discuss Proposed Revisions to ASTM E 2141-01 and Other Topics Raised by Members of the Task Group.
7. Adjourn

Enclosures: DOCUMENT 1 (This Page)

DOCUMENT 2. Minutes from Dallas, TX Meeting for Item 2

DOCUMENT 3. Revised Draft Standard Test Method for Assessing the Current-Voltage Cycling Stability at 90°C of Absorptive Electrochromic Coating on Sealed Insulating Glass Units.

DOCUMENT 4. Revised Draft Standard Test Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coating on Sealed Insulating Glass Units (Clean Copy)

DOCUMENT 5. Draft Standard Test Method for Assessing the Stability in High Humidity or Cyclic Temperature Environments of Absorptive Electrochromic Coating on Sealed Insulating Glass Units.

NEXT MEETING of E06.22.07: E06: October 13-16, 2002, Norfolk, VA. For E06.22.07, I have asked that our Task Group be scheduled for 4-h on Monday, Oct.14, 2002.

Addendum to the Agenda

Proposed Revisions to ASTM E2141 to be Considered by the Task Group E06.22.07.

At the end of Section 5, propose that the sample sizes will be 254 mm x 254 mm (10" x 10").

In Section 8.3.1, revise the wording in the ninth sentence as follows: "For example, with a chamber air temperature of $60^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($140^{\circ}\text{F} \pm 2^{\circ}\text{F}$), the average ECW surface temperature reaches a steady state temperature of about $85^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($185^{\circ}\text{F} \pm 2^{\circ}\text{F}$) depending on the sample size, optical PTR-ratio reached during voltage cycling, location of the device in the test plane, and the ECW construction."

In Table 1, propose that the "Cycles at $60^{\circ}\text{C} \pm 5^{\circ}\text{C}$ " be changed to "Cycles at $85^{\circ}\text{C} \pm 5^{\circ}\text{C}$."

Propose adding NOTES as follows:

At the end of Section 5, add

NOTE 1 (and NOTE 1 becomes NOTE 2): Caution: the seals in IGUs may fail at *lower* temperatures than those planned for testing, i.e., 70°C to 105°C . A seal failure will virtually guarantee failure of the ECW coating, so no assessment of the ECW coating will be made if a seal fails during the test.

NOTE 2 becomes NOTE 3 and NOTE 3 becomes NOTE 4.

Immediately after section 8.5.1, add

NOTE 5: as ECWs age from exposure to accelerated weathering (Section 8.5), the times to color and bleach usually become longer (Fig. 5). Rigidly using the coloring and bleaching times for the new device on an aged device may result in a PTR of less than 4, but the device still may be suitable for conserving energy in buildings. Before an ECW is deemed a failure, the times to color and bleach should be extended for up to 30 min or up to the time it takes for the rate of change of the transmittance to become less than about 0.4% of the transmittance per minute in the colored or bleached state, respectively, whichever yields the shorter time to color or bleach. If a PTR of less than 4 is still obtained when using times of up to 30 min to color or bleach, then the device fails this performance criterion.

Immediately after section 8.6, add

NOTE 5: the uniformity tests should be made when the ECW is held at a constant transmittance. To establish a given transmittance state for assessing the uniformity of the ECW, the manufacturers should be asked to provide control information (voltage, current, time) that will result in a constant transmittance of the ECW in the colored and bleached state, and this information should be used.

Immediately after Section 9.1, add

NOTE 6. The coloration efficiency may be difficult to assess for solid state devices in which the measured current is the sum of the ionic and electronic currents and not just the ion current, i.